

WHAT IS CLAIMED IS:

1. A stage unit comprising:
a sample stage that holds a sample;
5 a stage driving mechanism that drives the sample stage in at least one direction;
a first transmitting member to which at least one part of the stage driving mechanism is connected and a reaction force caused by driving the sample stage is
10 transmitted; and
a first damping member that is arranged on the first transmitting member and damps a vibration of the first transmitting member.
2. A stage unit according to Claim 1, wherein
15 the stage driving mechanism comprises a stator arranged on the first transmitting member and a mover that is driven together with the sample stage by an electro-magnetic interaction between the stator and the
20 mover.
3. A stage unit according to Claim 1, wherein
the first damping member is arranged to a position where a maximum strain of the first transmitting member
25 is caused.
4. A stage unit according to Claim 1, wherein
the first damping member is a piezo-electric

electrodes at both ends and earthed via a resistor.

stage unit according to Claim 1, the damping member is an electro-mechanical transducer that generates a mechanical strain in the damping member, and the unit further comprises a controller that controls the electro-mechanical transducer in response to a force caused by driving the stage unit according to Claim 5, the controller controls the electro-mechanical transducer on an instructing value of a control signal.

stage unit according to Claim 6, the controller feed-forward controls a deformation of the electro-mechanical transducer in response to a deformation of the electro-mechanical transducer generates a deformation of the damping member to cancel a deformation, which is caused by the first transmitting member by the reaction of the first transmitting member.

stage unit according to Claim 1, the stage unit further comprises a base that movably supports the stage unit, and the first transmitting member is connected to the base by the first transmitting member.

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Constructing

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a stage base that movably supports the sample stage and is supported by the first transmitting member.

9. A stage unit according to Claim 1, wherein
the sample stage comprises: a first stage that
moves in the one direction; and a second stage that holds
5 the sample and can be relatively moved to the first stage.

10. A stage unit according to Claim 9, further
comprising:

a second transmitting member in which a reaction
10 force caused by driving the second stage is transmitted
via the first stage;

a linear actuator that drives the second
transmitting member in the one direction;

a second damping member that is arranged on the
15 second transmitting member and damps a vibration of the
second transmitting member due to the reaction force
caused by driving the second stage; and

a first controller that controls the stage driving
mechanism and the linear actuator so that the first stage
20 and the second transmitting member integrally move in the
one direction.

11. A stage unit according to Claim 10, wherein
the second damping member is arranged to a position
25 where a maximum strain of the second transmitting member
is caused.

12. A stage unit according to Claim 10, wherein

the second damping member is an electro-mechanical transducer that generates a mechanical strain by applying an electric energy, and

the stage unit further comprises a second
5 controller that controls the electro-mechanical transducer in accordance with the reaction force caused by driving the second stage.

13. A stage unit according to Claim 12, wherein
10 the second controller controls the electro-mechanical transducer based on an instructing value of a drive force of the second stage.

14. A stage unit according to Claim 13, wherein
15 the second controller feed-forward controls a voltage applied to the electro-mechanical transducer so that the electro-mechanical transducer generates a deflection deformation to cancel a deformation, which is caused in the second transmitting member by the reaction
20 force, in the second transmitting member.

15. An exposure apparatus comprising a mask stage unit including a mask stage that moves and holds a mask, as a sample, having a pattern, and a substrate stage unit
25 including a substrate stage that moves and holds a substrate, as a sample, onto which the pattern is transferred, wherein

the stage unit according to any one of Claims 1 to

14 is used for at least one of the mask stage unit and the substrate stage.

16. An exposure apparatus according to Claim 15,
5 further comprising

a projection optical system that is arranged between the mask and the substrate and projects the pattern onto the substrate.

10 17. An exposure apparatus according to Claim 16, further comprising

a holder that is independent of the first transmitting member with respect to a vibration and holds the projection optical system.

15 18. An exposure apparatus according to Claim 15, further comprising

a controller that synchronously moves the mask and the substrate, when the pattern is transferred onto the
20 substrate.

19. An exposure apparatus that forms a pattern on a substrate while a stage moves, comprising:

a stage base that movably supports the stage;
25 a counter stage that moves in a direction opposite to the stage in accordance with movement of the stage;
a first supporting frame that is arranged independently of the stage base and movably supports the

counter stage; and

a damping member that is arranged on the first supporting frame and damps a vibration of the first supporting frame.

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20. An exposure apparatus according to Claim 19, wherein

the stage is a substrate stage that holds the substrate and moves.

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21. An exposure apparatus according to Claim 19, wherein

the stage is a mask stage that holds a mask on which the pattern is formed and moves.

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22. An exposure apparatus according to Claim 19, further comprising

a driver that drives the stage and at least one part of which is connected to the counter stage.

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23. An exposure apparatus according to Claim 22, wherein

the driver has a mover and a stator and the stator is arranged on the counter stage.

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24. An exposure apparatus according to Claim 19, further comprising

an original-position return mechanism that returns

a position of the counter stage to an origin.

25. An exposure apparatus according to Claim 19, further comprising:

5 a projection optical system that projects the pattern onto the substrate; and

a second supporting frame that is arranged independently of the first supporting frame with respect to a vibration and supports the projection optical system.

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26. A device manufacturing method including a lithography process, wherein

exposure is performed in the lithography process by using the exposure apparatus according to any one of

15 Claims 16 to 25.

27. A device manufactured by the device manufacturing method according to Claim 26.

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